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THE RELATIONSHIP OF THE EARLY SPRING BLUES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The simple fact which Mr. W. H. Edwards published in this journal last May* has thrown great doubt over the relationship of all the American species of *Cyaniris*. From eggs laid in September, 1874, by *C. Pseudargiolus*, he reared in the following February *C. violacea*. From this fact he is led to conjecture that in W. Virginia, where his experiments were made, *C. neglecta* may prove to be a goneutic form of the same species, reducing the entire series in that district to one. He also infers that further north *C. Lucia* and *C. neglecta* are forms of one species, though how this can be reconciled with the previous conjecture he does not explain.

Against the inference concerning *C. Lucia* and *C. neglecta*, Messrs. Saunders and Lintner reasonably urge† that *C. Lucia* is unknown in well worked districts where *C. neglecta* is abundant. This would at first seem to disprove any such relationship between them; but when it is remembered that *C. Pseudargiolus* exists in abundance in California, in districts well explored by resident collectors, while *C. violacea* (raised by Mr. Edwards from *C. Pseudargiolus*) has not yet been found; then we must conclude either that the *Pseudargiolus* of California is a different species from the *Pseudargiolus* of W. Virginia (whereas specimens from the two countries are wonderfully alike), or else that *C. neglecta* may be genetically preceded by *C. Lucia* in one place and not in another.

In writing to Mr. Edwards I also objected, as he remarks in a note appended to his paper, that in Massachusetts *C. neglecta*, *Lucia* and *violacea* all appear in May; but this statement, as Mr. Edwards surmises, is incorrect, and must have been made from memory. To illustrate the subject

* Vol. vii, pp. 81-2.

† This journal, vii, pp.

I append to this paper full extracts from the account of the different species of *Cyaniris*, as written several years ago for my book on New England Butterflies, omitting only that of *C. Pseudargiolus*, as I had nothing to add to Mr. Edwards' account in the "Butterflies of North America."

These considerations, and the hypothesis presently to be offered, show that observations are needed in many different places upon the succession of the broods of all the forms of *Cyaniris*. Fruitful results would surely follow from a series of complete observations for a single season in such separated localities as W. Virginia, Philadelphia, the Catskills, Albany, Boston, the White Mts., Quebec, Montreal, London, Ont., Detroit, Chicago, St. Louis, Lawrence, Ks., Denver, Col., and San Francisco—all, excepting Denver and the mountains, places where there are resident collectors. The present article is written for the purpose of drawing attention to this point.

In W. Virginia, three forms of *Cyaniris* appear: First, one (*violacea*) of medium size, in which the spots on the under surface of the wings are of medium size and distinct, and the marginal markings are cloudy angular lunules; in which some females are wholly brown above, and others blue with a heavy brown border. Second, and later, one (*Pseudargiolus*) of large size, in which the spots on the under surface are scarcely more than dots and very light, and the marginal markings are cloudy angular lines; in which all the females are blue above, but with a dash of white in the middle of the fore wing. And third, occasionally, a form (*neglecta*) almost wholly like the latter, but smaller.

In Albany and London, which, zoologically speaking, are more southerly stations than the vicinity of Boston (or, rather, situations more accessible to southern influences), the second of the forms just mentioned does not seem to have been recognized.* As far as I am aware, the females of the first (*violacea*) are always blue.

In the neighborhood of Boston we have: First, a small species (*Lucia*), in which the spots on the under surface of the hind wings are very large, usually completely confluent and often suffusing nearly the whole base of the wing, and the marginal markings tend to form a broad band with serrate interior margin; in which the females, always blue, have seldom any trace of pale color on the upper surface of the fore wings.

* Lintner, however, catalogues it from New York.

Second (later), a form precisely like the *violacea* of W. Virginia, but with the female never brown. Third (still later), a form with faint markings corresponding to the *neglecta* of W. Virginia; occasionally in midsummer large specimens of this are taken, and these I have considered *Pseudargiolus*.

In all these places the earliest forms, or those called *violacea* and *Lucia*, have the disc of the upper surface of the fore wings of the female blue (excepting, of course, the brown females of the southern *violacea*), untinged or scarcely tinged with white; while the later forms always have a whitish blotch or dash on the fore wings of the female.

In California and Oregon three forms occur, but at what seasons I cannot say; two of these altogether correspond to the *Pseudargiolus* and *neglecta* of the East, while the third (*Piasus*) is as large as the former and has much heavier markings beneath, but the females are strongly marked with white on the upper surface of the fore wings.*

With this last exception, the specimens of *Cyaniris* in any one locality seem to become larger, more lightly marked beneath and to show a stronger tendency to paleness on the upper surface of the female as the season advances. In view of this, and of the known relationship of *C. violacea* and *C. Pseudargiolus* in W. Virginia, may it not be possible that there is but a single species of *Cyaniris* in N. America? For this, it is necessary to assume some such hypothesis as the following, which is suggested solely in the hope of stimulating investigation and arriving at perfect knowledge: That in W. Virginia the first brood of this single species appears as *violacea* with both brown and blue females; the succeeding broods as *Pseudargiolus*, with occasionally (perhaps in seasons unfavorable for the growth of the larva or its food-plant) a few individuals of smaller size (*neglecta*). That in New York and Ontario, the first brood appears as *violacea* with only blue females; and the succeeding broods as *neglecta* with occasionally a few larger specimens (*Pseudargiolus*); this being the centre of the latitudinal range of the insect, the distinction between the broods would appear less marked than elsewhere. That in New England and further north the first brood appears as *Lucia* and *violacea*—the earlier individuals of the brood *Lucia*, the later *violacea*, just as the first brood

* A species of *Cyaniris* exists in Western Texas, but I possess only females. These resemble *C. neglecta* more closely than any other of the known forms, but are much paler throughout. They were taken between the middle of September and the middle of October.

of *Ajax* is made up in W. Virginia of an earlier appearing *Walshii* and a later *Telamonides*; the subsequent broods as in New York. That in the high north there is a single brood—the spring form *Lucia* alone. That in California (until we have further knowledge) the early spring brood is absent and the summer broods are made up of *Pseudargiolus* with occasional smaller (*neglecta*) and occasional more heavily marked (*Piasus*) individuals. On this hypothesis, *Lucia* is a boreal and colline form of *violacea*, and the summer broods of the species are absent in the extreme north, or, further south, consist of larger (*Pseudargiolus*) and smaller (*neglecta*) individuals, according to conditions more or less favorable to growth.

Of course this hypothesis is based principally upon my personal knowledge of the sequence of forms in New England, and may prove altogether wrong. I believe, however, that it is worth considering. If it appear complicated, it need only be said that there is complication somewhere. And furthermore, while Mr. Edwards in W. Virginia raised *violacea* in the spring from progeny of *Pseudargiolus* which went into chrysalis the autumn previous, Mr. Abbot in Georgia years ago raised *Pseudargiolus* (or what he called *Argiolus*) in March from caterpillars which went into chrysalis the last of April of the preceding year. The spring brood, therefore, is probably made up, in the south at least, of butterflies which existed as caterpillars at various times during the whole of the previous year. This is precisely what Edwards has admirably proved of *Ajax*; and if it be a constant phenomenon in *Cyaniris*, then it is likely to be equally true at the north, and the probable occurrence of dimorphism in the first brood at the north (*Lucia-violacea*) would be similar to the same phenomenon in *Ajax* at the south (*Walshii-Telamonides*) and the two features may yet be proved to have a logical connection.

It may also be added that it is extremely uncommon for two such closely allied species as *neglecta* and *Lucia*, living in the same district, to differ as much as it has been supposed they do, in the number of their broods, *Lucia* appearing in New England but once, *neglecta* twice a year*; indeed only one instance among New England butterflies occurs to me, and that is somewhat doubtful. I refer to *Limochores Taumas* and *L. Manataqua*, the former of which is double brooded, and the latter, as far as I know, single brooded; the data, in the latter case, however, are

* The second brood appears to be invariably less abundant than the first.

but scant. Still these are butterflies which do not fly before June, while the species of *Cyaniris* appear early in the spring and thus have a much better chance to develop a second brood. Should my hypothesis of the Californian *Cyaniris* be brought against me, as presuming a double instead of a triple brood, as in Eastern America, I would reply that there is a much greater difference between monogeneutism and digenutism than between the latter and trigoneutism. It is a much more common thing for a digoneutic insect to become trigoneutic in a southern station, than for a monogenetic to become digoneutic under those influences. Therefore, knowing that the form *neglecta* appears twice a year, it should be regarded, *a priori*, as probable that *Lucia* is succeeded by another brood (not necessarily resembling it) the same season.

As to the European *C. Argiolus*, it is double brooded, but I do not find reference to any difference between the broods.

In this paper, for readier comparison with what has been previously written, I have used the terms *Pseudargiolus*, etc., as Edwards employs them. It is plain to me, however, that the *Pseudargiolus* of Boisduval and LeConte is the form described by Edwards under the name of *violacea*, and I have so placed it in my revision of the species of this group, recently presented to the Buffalo Society of Natural Sciences.

Appendix; On the Seasons of the Species of Cyaniris in New England.

C. NEGLECTA.—Like the preceding species [i. e., *C. Pseudargiolus*] this insect is double brooded, hybernating in the chrysalis state. The earliest males appear at or shortly before the middle of May, but do not become abundant before the last week in the month; the first females appear about ten days later than the males, but are still rare at the beginning of June, although they disappear toward the end of the month or early in July. The eggs are probably laid in the middle and latter part of June and most of the caterpillars become full grown in the early part of July; how long a time is passed in the chrysalis is unknown, but the earliest butterflies of the second brood appear about the first of July and continue to emerge from the chrysalis until the first of August; they become abundant by the middle of July, although the males are often still greatly in excess in the latter half of the month, and in spite of their great delicacy these insects may still be seen in September. This brood

does not appear to be so abundant as the first ; we have no knowledge whatever of its subsequent history ; probably the eggs are laid in August and hatch at once, the caterpillars attaining their growth in the latter part of September and transforming to chrysalids before winter.

C. VIOLACEA [after quoting Mr. Edwards' statement of its seasons in W. Virginia, as given in the Butterflies of N. America, the account continues]—In the north, however, it appears and disappears much later, for it makes its advent during the first week in May, both sexes becoming abundant toward the end of the month, and it still remains upon the wing throughout June ; one specimen has been taken in Walpole, N. H. (Smith), as late as the 7th of July. Of its further history we know nothing ; probably the eggs are laid in June and the caterpillar transforms in July, the chrysalids remaining unchanged until spring.

C. LUCIA.—It is a single brooded insect and the first of our butterflies to appear fresh from the chrysalis in spring. The earliest specimens gladden our eyes about the middle of April, although often delayed a week by inclement weather ; the earliest recorded date is that of April 14 (W. Roxbury, Mass.-Faxon). It becomes abundant a week after its advent and continues so throughout the first half of May, when it begins rapidly to decrease and by the end of the month is seldom seen. In elevated and northern localities it is unquestionably later in its appearance and disappearance, since male specimens (rubbed indeed) have been taken in Williamstown, Mass., as late as the middle of June (Scudder), in the White Mts. not uncommonly up to the 17th of the month (Scudder), and occasional specimens even on the 23rd-24th (Sanborn), while in Quebec it is "very abundant at the end of May" (Bowles), and in Southern Labrador was "common from the first of June to the end of July" (Couper). In Alaska, the females taken during the first week in June (Dall) were rubbed, but this may have been due to poor collecting implements. In New England the eggs are laid towards the middle of May ; this state probably continues a week, but how soon the caterpillar becomes full grown is unknown ; it undoubtedly hibernates in the chrysalis state.

CAPTURES OF NOCTUIDÆ NEAR ORILLIA, IN THE
PROVINCE OF ONTARIO, CANADA.

BY GEO. NORMAN, CHERRY HILL, FORRES, SCOTLAND.

During the season of 1875 I collected Noctuæ near Orillia, in the Province of Ontario. The locality where I resided was the Couchiching Hotel, a place of great beauty, situated on a wooded isthmus dividing Lake Couchiching from Lake Simcoe.

From the varied nature of the ground, enormous forest tracts, swamps, etc., I fully expected the locality would have been more productive in insects than my last year's place of sojourn, St. Catharines, which was, comparatively speaking, very poor and with very little timber. In this I was much disappointed, possibly owing more to the bad season than to the locality. The season was an unusually cold one. This, combined with the high and cold winds which prevailed at nights during the whole summer, was very much against sugaring, and certainly rendered it one of the very worst collecting seasons I ever experienced.

I may here mention that Mr. F. Grant, who has resided at Orillia some years, has found *Agrotis fennica* not unfrequent on a species of *Spiræa*, visiting the flowers. He has also taken *Plusia striatella*, *M. Comstockii*, *Agrotis gilvipennis*, *Adita chionanthi* and other rare Noctuæ.

In sending a list of my captures to the CANADIAN ENTOMOLOGIST, I have deemed it advisable, in order to prevent confusion, to adopt the arrangement and nomenclature of Mr. Grote's lately published "Check List." In spite of the above mentioned drawbacks, it will be seen that the locality has not failed to yield a few species new to science. These have been kindly determined and described by Mr. Grote, of Buffalo, to whom my best thanks are due. The following species may be added to my list of St. Catharines captures: *Agrotis decolor*, *Acr. vinnula*, *H. badistriga*, *P. angulata*, *A. plecta*, *T. v-brunneum*, *A. gladiaria*.

Raphia frater. July 4th; rare at light.

Momophane (Diphtera) Comstockii. (Mr. Grant).

Diphtera fallax. July 2nd; at sugar; not uncommon.

Apatela (Acronyda) occidentalis. June 7th; common at rest and sugar.

— *morula*. July 7th; not uncommon at sugar.

- Apatela hasta*. June 20th ; rare at sugar.
- *innotata*. July 11th ; common at sugar.
- *hastulifera*. July 15th ; rare at sugar.
- *noctivaga*. June 15th ; common at sugar.
- *superans*. July 11th ; not uncommon at sugar.
- Agrotis sigmoides*. June 21st ; bred from larvæ ; afterwards frequent at sugar.
- *haruspica*. July 15th ; very common at sugar.
- *phyllophora*. July 22nd ; rare at sugar.
- *baja*. July 29th ; very common at sugar.
- *C. nigrum*. June 24th ; bred from larvæ ; very frequent at sugar.
- *bicarnea*. June 17th ; bred from larvæ ; very abundant at sugar.
- *herilis*. August 11th ; not unfrequent at light and sugar.
- *triosa*. August 18th ; rare at light and sugar.
- *badicollis*. August 4th ; not rare at rest.
- *rubifera*, n. s. July 24th ; very common at sugar.
- *conflua*. August 11th ; rare at sugar.
- *Normaniana*. August 11th ; common at sugar ; much darker than St. Catharines specimens.
- *pecta*. July 16th ; not uncommon at sugar.
- *gularis*, n. s. August 12th ; not uncommon at flowers, sugar and light.
- *cinereomacula*, n. s. July ; not unfrequent at flowers.
- *turris*, n. s. August 20th ; not unfrequent at sugar and light.
- *friabilis*, n. s. August 4th ; rare at sugar.
- *versipellis*, n. s. June 20th ; not unfrequent at light.
- *campestris*, n. s. Not uncommon at light and sugar.
- *tesselata*. July 11th ; very common at sugar and light.
- *clandestina*. June 27th ; bred from larvæ ; very common at sugar.
- *alternata*. August 8th ; very common at sugar.
- *cupida*. August 25th ; very common at sugar.
- *mesoria* (*Cochrani*). August 2nd ; swarming at sugar and light.
- *saucia*. July 7th ; exceedingly common at sugar.
- *suffusa*. August 12th ; very abundant at sugar.
- *venerabilis*. September 9th ; rare at light.
- *pressa* (*Aplecta*). July 5th ; common at rest and sugar.

- Agrotis occulta* (*Aplecta*) August 16th; not rare at sugar.
 ——— *prasinata* (*Aplecta herbida*). July 8th; very common at sugar.
Pachnobia Orilliana, n. s. May 13th; not unfrequent at palms.
Matuta Catharina. May 10th; not uncommon at palms and light.
Mamestra vicina. August 4th; rare at rest.
 ——— (*Aplecta*) *nimbosa*. July 14th; not uncommon at sugar.
 ——— (*Aplecta*) *imbriferata*. Bred from larvae often, and at sugar.
 ——— *atlantica* = *H. suasa*? June 21st; rare at light.
 ——— *albifusa*. June 7th; very common at rest.
 ——— *claviplena*. June 2nd; common at sugar.
 ——— *olivacea*. August 6th; common at rest and sugar.
Hadena arctica. July 9th; very abundant at light, rest and sugar.
 ——— *devastatrix*. July 1st; the most abundant moth at light, rest and sugar.
 ——— *apamiformis*. August 7th; rare, one specimen at light.
 ——— *sputatrix*. July 12th; exceedingly common at sugar.
 ——— *dubitans*. July 19th; rare at sugar.
 ——— *sectilis*. June 28th; not uncommon at sugar.
 ——— *mactata*. August 19th; very abundant at sugar.
 ——— *modica*. August 14th; not uncommon at sugar.
 ——— *fractilinea*. August 24th; not uncommon at sugar.
 ——— *chalconia*. June 14th; not common at sugar.
 ——— *renigera*. July; very common at rest and light.
Dipterygia scabruiscula (*Pinastris*). July 1st; not unfrequent at sugar and rest.
Hyppa xylinoidea. June 12th; very common at sugar and rest.
Actinotia (*Cloantha*) *ramosula*. August; one specimen at light.
Callopietria mollissima. August 12th; rare; one specimen at sugar.
Conserpula anodonta. July 21st; not uncommon at sugar.
Trigonophora periculosa. July 21st; not rare at sugar.
 ——— *v-brunneum*, n. s. July 24th; not rare at sugar.
Euplexia lucipara. June 9th; frequent at light and sugar.
Brotolomia iris. June 21st; rare at light.
Nephelodes violans. August 21st; very frequent at light, rest and sugar.
Helotrophata reniformis. August 12th; very abundant at sugar.
 ——— *atra*, n. s.? With the last, but not so frequent.
Hydroecia nictitans. July 17th; very common at sugar.
 ——— *sera*. July 15th; common at sugar.
Arzama obliquata. July 14th; rare at light.

- Heliophila pallens*. July 16th; rare at sugar.
 ——— *unipuncta*. June 21st; very common at flowers and sugar.
 ——— *pseudargyria*. July 15th; rare at sugar.
Laphigma frugiperda. September 6th; rare at sugar.
Caradrina miranda. August 9th; rare at sugar.
 ——— *multifera*. August 8th; very abundant at sugar, light and rest.
Pyrophila (Amphipyra) pyramidoides. August 7th; very abundant at sugar.
 ——— *trogopoginis*. August 8th; common at sugar and rest.
Parastichtis gentilis. July 25th; rare at sugar.
 ——— *perbellis*. July 18th; rare at sugar.
 ——— *minuscule*. September 9th; rare at light.
Crocigrapha Normani. May 17th; not uncommon at palms.
Teniocampa alia. May 20th; very rare at palms.
 ——— *oviduca*. June 9th; very rare at light.
Orthodes infirma. July 10th; common at sugar.
 ——— *cynica*. July 18th; common at sugar.
Eucirraëdia pampina. August 24th; abundant at sugar.
Orthosia infumata. September 12th; rare at sugar.
 ——— *ferruginoides*. August 29th; very common at sugar.
 ——— *togata (silago)*. September 10th; not common at rest and sugar.
Scoliopteryx libatrix. Very common at sugar all the season.
Litholomia napæa, n. g. et sp. May 11th; rare at willows.
Lithophane (Xylina) petulca. September 10th; very abundant at sugar.
 ——— *ferrealis*. September 2nd; common at sugar.
 ——— *Bethunei*. September 2nd; swarming at sugar.
 ——— *semita*. May 18th; rare at palms. September 9th; common at sugar.
 ——— *Georgii*, n. s. September 5th; not uncommon at sugar.
 ——— *disposita*. Rare at palms in May; abundant in Sept. at sugar.
 ——— *cinerea*. Rare at palms in May; September 15th, occasionally at sugar.
 ——— *laticinerea*. September 15th; rare at sugar.
 ——— *oriunda*. September 8th; rare at sugar.
Anytus sculptus. August 21st; rare at sugar.
 ——— *capax*. September 14th; rare at sugar.
Calocampa nupta. May at willows. September 11th; common at sugar.
 ——— *curvifascia*. May at willows. September 14th; not uncommon at sugar.

- Lithomia germana*. September 5th; very abundant at sugar.
- Plusia aereoides*. August 7th; not common at rest.
- *purpurigera*. August 1st; at thistle blooms.
- *bimaculata*. August 28th; rare at rest.
- *striatella*. (Mr. Grant).
- *simplex*. June 8th; rare over flowers.
- *u-aureum*. September 9th; rare at light.
- Pyrrhia exprimens*. August 2nd; rare over flowers.
- Galgula hepara*. September 9th; rare at rest.
- Eustrotia carneola*. June 12th; common at rest and sugar.
- *nigritula*. July 9th; not unfrequent at sugar.
- Drasteria erichto*. May 2nd; not common.
- Paralltelia bistriaria*. July 2nd; not unfrequent at sugar.
- Catocala relictæ*. September 10th; saw several at sugar.
- *unijuga*. August 14th; not common at sugar.
- *Briseis*. July 21st; common at sugar and rest.
- *parta*. August 29th; rare at sugar.
- *ultronia*. July 27th; common at sugar and rest.
- *concumbens*. August 11th; not common at sugar.
- *ilia*. August 12th; rare at sugar.
- *antinympha*. (Mr. Grant).
- *cerogama*. August 11th; very common at sugar.
- *præclara*. August 2nd; not unfrequent at sugar.
- *fratercula*. August 18th; rare at sugar.
- *gracilis*. August 11th; rare at sugar.
- Homoptera calycanthata*. May 28th; common at sugar.
- Pseudaglossa tubricalis*. One of the most abundant at sugar throughout the season.
- Epizeuxis Americanalis*. Exceedingly common at sugar.
- Xanclognathe lævigata*. Rare in July.
- *ochreipennis*. Not unfrequent at sugar in July.
- Renia plenilinealis*. August 24th; not unfrequent at sugar.
- Bleptina caradrinalis*. Not common at sugar in July.
- Bomolocha perangulalis*. July; very abundant at sugar.
- *abalienalis*. July 20th; common at rest and sugar.
- *Baltimoralis*. Very frequent at sugar.
- *hijugalis*. June; not unfrequent at sugar.
- Hypena subrufalis*. August; not unfrequent at sugar.

Hypena evanidalis. August 13th ; rare at sugar.

Platyhypena scabra. Common at sugar.

Bruphos infans. At birch trees in May (Mr. Grant).

NOTES ON CATOCALAS.

BY THE EDITOR.

For several years past we have had in our possession bred specimens of a small species of *Catocala* near *polygama*, which we have been unable to refer with certainty to that species, and yet in the imago state the differences between the two are so inconspicuous that we have felt a hesitancy in describing the one as distinct from the other. There is, however, what appears to us to be a strongly marked difference between the larvæ of the two species, and chiefly on this ground we have been induced to describe them as distinct. The larvae of both species feed on thorn.

Catocala crategi, *n. s.* Larva. Specimens taken by bush beating about the middle of June. Length about one and a half inches, onisciform. Head flat, medium sized, slightly hairy, grayish, with a few blackish streaks and dots ; bilobed, each lobe tipped with reddish, mixed with white ; these colors margined before and behind with blackish brown, in which are dots of a paler hue ; sides of head pale greenish white, with a faint network of brownish lines.

Body above greenish ash color, with many minute dots of brownish black, some of them forming indistinct and imperfect lateral streaks ; dorsal line very slightly paler than general color. Second and terminal segments with a number of small whitish dots, each emitting a single hair. On each side of the dorsal line is a row of small tubercles, those on third segment whitish tipped with black, on fourth reddish tipped with dull white ; on the remaining segments they are a little larger and decidedly red tipped with whitish. Between each of these, and running in the same direction, is a small whitish dot or minute tubercle ; each and all of these tubercles emit a single brownish hair. The upper portion of the ninth segment is raised, and on its centre there arises a thick, fleshy horn

about one-tenth of an inch long, slightly curved backwards, of a dull dark reddish color, thickly dotted with black about the base. The usual dark patch on ninth and tenth segments is wanting, excepting close to under surface, where it is faintly visible. Twelfth segment scarcely raised, with no black streak behind, but having a faint line formed by a row of black dots extending obliquely down the sides towards the front. Terminal segment flattened; lateral fringe of a decided rosy pink hue; spiracles whitish encircled with black.

Under surface whitish green, with a tinge of blue; a central row of brownish black spots larger and deeper in color on seventh and eighth segments, decidedly paler on second, third and fourth, and of a reddish brown on segments from ninth to thirteenth inclusive. Feet pale greenish, faintly marked with brown; prolegs bluish green, hinder three pairs streaked and dotted with black.

Occasionally specimens not full grown have been met with of a darker shade, arising from their being more thickly dotted with black; in these the tubercles have been less decidedly red, while the fleshy horn approached the general color, but was thickly covered with blackish dots.

The moths produced from this larva very much resemble *polygama*, but are smaller. The brown filling of the subterminal space is obsolete or very pale; the transverse posterior line has the lower tooth very small, while the line itself is narrow; in *polygama* the teeth are sub-equal; the sub-costal angulation of the line is also less pronounced and the sub-reniform is connected with and very near the transverse posterior line. In 25 specimens of *polygama* the sub-reniform is connected with the transverse posterior line only in a single specimen. The transverse posterior line between the lower discal tooth and vein 2, where it joins the sub-reniform, is more directly oblique and even; in *polygama* this line, though sometimes uneven, seems to form a regular curve. The transverse anterior line appears to be more regularly arcuate. The hind wings and under surface are almost identical with *polygama*. From both sexes carefully examined we are unable to give any further points of difference.

We would here remark that in six additional specimens of *polygama* the lower tooth of the t. p. line is smaller than the upper. Possibly none of the points of difference urged are in themselves invariable, nor perhaps such as would suggest the separation of the species; at the same time, it is possible that some essential differences may have escaped our

observation. The differences in the larva, to be presently referred to, will, we think, excuse us for regarding the species, at least for the present, as distinct. All the specimens referred to, including an example of the larva preserved in alcohol, have been submitted to Mr. Grote, who thinks the species are probably distinct.

Larva of *Catocala polygama* found feeding on thorn about the middle of June. Length about one and three-quarter inches. Head flat, sprinkled with fine brownish hairs; bilobed, each lobe tipped with whitish; color ashy grey with a wide black band above extending obliquely down the sides, in which are several dull faint reddish streaks.

Body above greenish grey, dotted with very minute blackish dots; on the anterior portion of second and third segments there are a few whitish dots, each emitting a single hair; a broken dorsal stripe of a paler hue imperfectly margined with black, the stripe becoming whiter on hinder portion of fifth, sixth, seventh, eighth and tenth segments. On fifth and sixth segments are two whitish patches similar in form, almost pointed anteriorly, posteriorly enlarging with the hinder edge concave, thus giving the widened portion a bilobed appearance; posterior portion of fifth segment rather darker than general color, with a slight purplish tint; hinder portion of ninth segment *slightly* raised and of a deeper color, the dark patch covering the anterior portion of tenth segment and extending down the sides close to under surface. Posterior portion of twelfth segment slightly raised and margined behind with black, the same color extending obliquely down the sides towards the front. On each segment there is a small tubercle on each side the dorsal line, of a greyish hue, but so small as to be scarcely visible, excepting those on twelfth segment, which are somewhat larger. Terminal segment flattened and spreading, with a few whitish dots on its hinder portion and two reddish brown tubercles on anterior portion. Lateral fringe close to under surface of a delicate pinkish tint; spiracles blackish.

Under surface whitish green with a tinge of blue, with a central row of blackish spots larger and deeper in color along the middle, smaller and paler towards each end. Feet and prolegs greenish, dotted and streaked with brown or brownish black.

Var. A.—Rather paler in color, dark patch on ninth and tenth segments and whitish patches on fifth and sixth segments less prominent, dark patch on fifth segment almost wanting; small tubercles on each side the dorsal line more apparent; spiracles brownish, faintly edged with white.

Var. B.—General color with a stronger tinge of green, and an indistinct pale irregular stripe on each side (this character is also faintly visible in specimens of Var. A); whitish patches on fifth and sixth segments faint; small tubercles same as in Var. A.

Var. C.—Much paler in color than either of the other varieties, with the body of a decidedly greenish tint. Dorsal stripe very faint; light patches on fifth and sixth segments scarcely visible; small tubercles on each side the dorsal line blackish or brownish black, and in consequence of the paleness of general color, appear more prominent; dark patch on fifth segment wanting, that on ninth and tenth segments present, but rather paler than in the other varieties; lateral fringe very pale, with a slight pinkish tint. Spiracles dark, faintly encircled with whitish.

In all these varieties the markings on the head are constant in the two species; the peculiar shaped patches on fifth and sixth segments in *polygama* are constant, but vary in distinctness. The small dorsal tubercles in *cratægi* are always more or less red, but the most prominent and valuable point of distinction is to be found on the ninth segment, which in *polygama* is never more than a slightly raised fold, while in *cratægi* it is invariably a distinct thick fleshy horn, about uniform in size. This one character will enable any collector instantly to separate the larvæ of the two species.

NOTES ON LEPIDOPTERA.

BY C. P. WHITNEY, MILFORD, N. H.

Thyreus Abbottii. Larva.

The larva of *Thyreus Abbottii* possesses a peculiar interest to the Entomologist, as it is the only species of which the sex is supposed to be indicated by the coloration. Frequent reference to this is found in works of different authors, and nowhere have I seen any doubt expressed about the validity of the distinguishing markings between ♂ and ♀ (*vide* Harris' Ent. Correspondence, p. 284; N. Y. State Museum Report, p. 114; CAN. ENTOMOLOGIST, 1874, p. 146).

In the season of 1873 I received from a friend eight of the supposed ♀ larvæ fully grown, taken on Sweetwater Grape. As I previously had reason to doubt the correctness of the theory that all with the uniform brown mottling were of one sex, I watched with considerable interest the next year's development.

May 16th, there appeared in the breeding box one ♂, one ♀ imagines; the 18th, another ♂ emerged, and the next day another ♀.

Being absent for some time afterward, I made no note of the remainder of the brood, nor do I now recollect if any more were disclosed.

None of these larvæ had any appearance of the green markings, nor have I ever seen any captured here which had, but have seen such in Massachusetts and New Jersey.

Lerema Loammi, nov. sp.

♂. Expands 11³/₈ in. Wings above dark glossy brown, darker basally. Ciliæ light brown, with a blackish line at extreme base. Primaries with a subcostal transverse row of quadrate whitish spots, situate one in each of the three terminal subcostal interspaces near its base; the upper one one-half its length nearer apex. A larger sub-quadrate spot crossing second median interspace at one-third the distance from its base. An obsolescent transverse line in lower median interspace, equidistant between its base and spot in second interspace. A narrow black sexual bar broken by first median nervule; the upper portion straight, commencing at second divarication of median nervure and crossing the interspace to first median nervule near its source. The lower portion of the bar commences below the nervule about its own width removed outwardly, is strongly concave within, and reaches submedian nervure about two-fifths its distance from base. Secondaries immaculate.

Beneath dark chestnut brown. Apex of primaries and border of secondaries with a bloom of pearly scales. Primaries with upper markings repeated and two minute dots in subcosto-median interspace, resting one on each nervule; one in first median interspace and a transverse line in third. These five (including one in second interspace repeated above) are in a line from apex to middle of internal margin.

Secondaries with a curved sub-basal row of three small irregular white spots. The first is in the costo-subcostal interspace one-fourth the distance from its base; the second in the subcosto-median interspace, and

the third on the submedian nervure. A subterminal sinuate row; the first double, situate in the costo-subcostal interspace midway between its other spot and its extremity. A black streak running from this spot sharply outward to next spot in subcosto-median interspace, which is followed in the succeeding interspaces by five more small transverse spots. All the spots of secondaries with a black border.

♀. Expands $1\frac{1}{2}$ in. General coloration a little lighter than in the male. Primaries above with two spots at extremity of disc. An irregular transverse band commencing with three subcostal spots, the upper one not removed outwardly as in the male; the fourth twice its own width nearer margin; the fifth in a line with first three; the sixth twice its width nearer base; the seventh largest, removed its width internally; the eighth double or with upper half obsolete. Lower surface of primaries with upper markings repeated. Secondaries with basal row inconstant. First three spots of subterminal row running toward outward margin; the others running at a right angle from third, toward inner margin. In one ♀ the subterminal row of secondaries is indicated above by a few lighter scales. 1 ♂, 3 ♀, Jacksonville, Fla. March 22nd, 23rd, 1875.

ON PLATYSAMIA COLUMBIA SMITH.

BY F. B. CAULFEILD, MONTREAL, P. Q.

In No. 4, Vol. ii, of the "Bulletin of the Buffalo Society of Natural Sciences," Dr. H. A. Hagen gives an interesting paper on this moth and its parasites.

After a brief review of the previous literature of the species, Dr. Hagen says: "If *columbia* should happen not to be a distinct species, it must be either a variety of some other species or a hybrid of two species." As regards its being a variety of *cecropia*, Dr. Hagen says that he has examined large numbers of *cecropia*, but never saw a variety agreeing with *columbia*; one small and dark colored male he indeed at first thought was an intermediate form, but on comparing it carefully he found it to be *cecropia*, though a somewhat remarkable variety; he therefore comes to the conclusion that *columbia* is not a variety of *cecropia*.

My own experience exactly corresponds with this. I have seen many specimens of *cecropia*, both large and small, light and dark, but nothing that would form a connecting link between the two insects. As regards the second eventuality, a hybrid form, Dr. Hagen says that he "believes it possible that *columbia* may be a hybrid, perhaps of *cecropia* and *promethea*; in favor of its being a hybrid would be the circumstance that such a large species should occur so rarely, while the large number of Lepidopterologists eager to secure this treasure operates against the idea of its being overlooked."

Columbia certainly is very rare, as yet having only been recorded from three localities, Norway, Maine, and Quebec and Montreal, Canada. However, between Maine and Quebec, and Quebec and Montreal, are doubtless many places as yet but little known to Entomologists, where *columbia* may at some future day be found in comparative abundance.

Dr. Hagen says: "The conjecture that *columbia* is a hybrid would not be worth mentioning, if there did not exist similar cases recorded by the most prominent authorities. Of course I speak only of cases of hybrids as imagos or caterpillars, from which imagos, when bred, have been collected in the open fields. The facts just at hand (I have no doubt that more are published) record caterpillars of hybrids of *Saturnia carpini* and *spini*, found in Austria, according to Lederer; caterpillars of *Sphinx epilobii*, a hybrid of *S. vespertilio* and *euphorbiae*, being found in France, according to Rambur; in the same country are found also caterpillars of *Sph. vespertilioides*, the hybrid of *S. vespertilio* and *S. hippophaes*, according to Boisduval and Lederer. The imagos and caterpillars of *Sph. phileuphorbia*, hybrids of *Sph. euphorbia* and *galii*, have been found near Berlin in several specimens. Hybrids of *Zygaena trifolii* and *filipendulae* were found in the imago state in England; hybrids of *Colias edusa* and *hyale*, of *Lycæna adonis* and *alexis*, of *Hipparchia arcania* and *hero*, of *Cænonympha pamphilus* and *iphis*, of *Vanessa urticae* and *atalanta*, are recorded from different countries."

This is an interesting list of hybrids taken at large, and proves (if proof were wanting) that hybrids occur amongst the Lepidoptera, but as there is only one *Saturnian* mentioned, I do not think it gives much support to Dr. Hagen's conjecture regarding *columbia*. I am of opinion that hybrids found at large must have arisen from chance encounters of the species that produced them, and therefore are to be looked for in families whose habits would be likely to bring them together, and in fact, with one exception, such is the case with the hybrids mentioned by Dr.

Hagen. The Sphinges proper (there is no *Smerinthus* mentioned) all frequent flowers. My friend, Mr. Hibbins, has taken in this locality (Montreal), at a cluster of lilac bushes, during one evening's twilight, examples of *Deilephila chamænerii*, *Sphinx chersis*, *Sph. drupiferarum* and *Sph. kalmia*. Mr. J. A. Lintner, speaking of the Noctuid *Cucullia intermedia*, says he has observed them at lilac blossoms associated with *Deilephila chamænerii*, *Amphion nesus*, *Thyreus Abbottii* and *Sesia thysbe*. Many other instances might be cited, but the fact is well known to all collectors that numbers of the Sphingidæ are constantly meeting while in search of food. This is also the case with the Zyganians, at least with the species mentioned by Dr. Hagen, as they not only frequent flowers but actually sleep on them. Edward Newman, in his Natural History of British Moths, says of *Zygæna minos*: "In some favored spots every daisy will have its tenant, and as many as eight or nine are sometimes seen clustered on a single flower of the dandelion." Of course the same rule applies to the Diurnals; I have myself taken in one afternoon, between the hours of two and four, at a patch of wild asters, examples of *Grapta commæ* (both forms), *G. faunus*, *G. progne*, *Pyrameis cardui*, *P. huntera* and *P. atalanta*, and once took *faunus*, *commæ* and *cardui* with one sweep of the net, so closely were they associated.

With the Saturnidæ, however, the direct opposite is the case; not taking food, they do not visit flowers, being solely occupied in providing for the continuance of their species, the female waiting for the attendance of the male.

Mr. L. Trouvelot, who has bred thousands of *Telea polyphemus*, gives a very full account of its habits in Vol. 1, *American Naturalist*. Speaking of the freshly emerged insect, he says: "The moth remains quiet all day and sometimes all night, and the following day, if the night be cold; but if it be warm and pleasant, at dusk, or about eight o'clock, a trembling of the wings is observed, and then it takes its flight, making three or four circles in the air. The male flies only a few minutes, and then rests for two or three hours in the same place. The female continues to fly about the bushes, and though a virgin, she lays eggs, which are, however, of no use for the propagation of the species; she continues doing so for two or three hours, and then rests all night attached to some plant, probably waiting for her mate. Soon after the female has laid these useless eggs the males become very active and fly in search of the female, whom they soon discover, especially if there is a slight breeze and the air is loaded with vapors."

If other proof were wanting, this, I think, shows pretty clearly that the female moth gives forth some attraction by which her presence is made known to the male, and I think there must be something peculiar to the female of each species which affects the males of that species only, and by which they are directed to their proper mate, otherwise all would be confusion and there would be no such thing as distinction of species.

Sembling is a method of taking the males of Bombycidæ known and practised by most Entomologists. Are there any instances on record of the female of one species having attracted the male of another?

In the CANADIAN ENTOMOLOGIST, vol. iv, p. 138, Mr. R. V. Rogers, of Kingston, Ont., states that a young female *cecropia* was confined in a box and exposed on a verandah. The first night five male *cecropias* were taken, on the second ten and on the third eight, while in the morning the remains of five others were found, which he supposed had been killed by cats. He also informs us that several specimens of *Teia polyphemus* were taken in the same manner. In the CAN. ENT., vol. v, p. 139, the Rev. C. J. S. Bethune states that on the 19th of June, 1873, he exposed a young female *cecropia* for several nights without success, the evenings being cool. On the 28th, the evening being warm and misty, six male *cecropias* were taken, and as the female had been so long in confinement the experiment was discontinued. Mr. Bethune also tells us that he tried the experiment with a female *promethea*, but as the cocoon had been brought from a distance, no males were attracted.

Dr. Hagen says: "There is perhaps another circumstance in favor of my conjecture. The hybrids of *Tetreao cerogallus* and *tetrix*, known as *Tetreao intermedia*, occur notoriously always when by excessive hunting the males of the first are killed in such a number that the females are obliged to recur to the males of the other species. Now it is not improbable that in times when some species of *Attacus* are extensively damaged by parasites, the interbreeding would be much facilitated."

(To be Continued.)

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